GACE® Middle Grades Mathematics Assessment (013)
Curriculum Crosswalk

	Required Coursework Numbers														
Subarea I. Arithmetic and Algebra (65%)															
Objective 1: Understands and applies knowledge of numbers and operations															
A. Understands operations and properties of the real number system															
• Solves problems using addition, subtraction, multiplication, and division of real numbers															
• Describes the effect that an operation has on a given number; e.g., adding a negative, dividing by a fraction															
• Applies the order of operations															
• Identifies or applies properties of operations on a number system; e.g., commutative, associative, distributive, identity															
• Compares, classifies, and orders real numbers															
• Performs operations involving exponents, including negative exponents															
• Simplifies and approximates radicals															
• Uses scientific notation to represent and compare numbers															
B. Understands the relationships among fractions, decimals, and percents															
• Finds equivalent fractions															
• Converts among fractions, decimals, and percents															

	Required Coursework Numbers														
• Represents fractions, decimals, and percents with various models															
C. Understands how to use ratios and proportional relationships to solve problems															
• Uses ratio language and notation to describe a relationship between two quantities															
• Recognizes and represents proportional relationships between two quantities															
• Uses proportional relationships to solve problems; e.g., rates, scale factors															
• Solves percent problems; e.g., discounts, taxes, tips, simple interest rates															
D. Understands how to use basic concepts of number theory (e.g., divisibility, prime factorization, multiples) to solve problems															
• Applies characteristics of prime and composite numbers															
• Applies characteristics of odd or even numbers															
• Solves problems involving factors, multiples, and divisibility															
E. Knows how to use estimation strategies to determine the reasonableness of results															
• Recognizes the reasonableness of results within the context of a given problem															
• Tests the reasonableness of results using estimation															
• Recognizes appropriate uses of estimation and rounding															

	Required Coursework Numbers														
• Estimates absolute and relative error in numerical answers to problems															
Objective 2: Understands and applies knowledge of algebra and its processes															
A. Understands how to evaluate and manipulate algebraic expressions, equations, and formulas															
• Performs arithmetic operations on polynomials															
• Manipulates and performs arithmetic operations on rational expressions															
• Evaluates, manipulates, and compares algebraic expressions involving radicals and exponents, including negative exponents															
• Uses variables to construct and solve equations in real-world contexts															
• Translates verbal relationships into algebraic equations or expressions															
B. Understands how to recognize and represent linear relationships algebraically															
• Determines the equation of a line															
• Recognizes and uses the basic forms of linear equations															
• Converts among various forms of linear equations; e.g., slope-intercept, point-slope, standard															
C. Understands how to solve equations and inequalities															
• Solves one-variable linear equations and inequalities															

	Required Coursework Numbers														
• Solves one-variable nonlinear equations and inequalities; e.g., absolute value, quadratic															
• Represents solutions to inequalities on the number line															
• Represents and solves systems of linear equations and inequalities with two variables															
D. Understands how to recognize and represent simple sequences or patterns; e.g., arithmetic, geometric															
• Evaluates, extends, or algebraically represents rules involving number patterns															
• Describes or extends patterns involving shapes or figures															
• Forms rules based on given patterns															
• Identifies patterns based on given rules															
Objective 3: Understands and applies knowledge of functions and their graphs															
A. Understands how to identify, define, and evaluate functions															
• Determines whether a relation is a function															
• Evaluates functions for given values; i.e., algebraically, graphically, tabular															
• Recognizes that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers															

	Required Coursework Numbers														
B. Knows how to determine and interpret the domain and the range of functions represented numerically, graphically, or algebraically															
• Determines the domain and range of a given table of values															
• Determines the domain and range from a given graph of a function															
• Determines the domain and range of a given function that is represented algebraically															
• Interprets domain and range in real-world settings															
C. Understands basic characteristics of linear functions; e.g., slope, intercepts															
• Determines the slope of a given linear function															
• Interprets slope as a constant rate of change															
• Determines the *x*- and *y*-intercepts of a given linear function															
• Interprets the *x*- and *y*-intercepts of a given linear function															
D. Understands the relationships among functions, tables, and graphs															
• Determines an equation to best represent a given linear graph															
• Sketches a graph, given an equation of a linear function															

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• Sketches graphs showing key features, given a verbal description of the relationship															
• Writes a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function															
• Compares properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)															
E. Knows how to analyze and represent functions that model given information															
• Develops a model (e.g., graph, equation, table) of a given set of conditions															
• Evaluates whether a particular mathematical model (e.g., graph, equation, table) can be used to describe a given set of conditions															
• Interprets a particular mathematical model; e.g., graph, equation, table															
Subarea II. Geometry and Data (35%)															
Objective 1: Understands and applies knowledge of geometry and measurement															
A. Understands how to solve problems involving perimeter and area of plane figures															
• Calculates and interprets perimeter and area of plane figures that can be composed of triangles and quadrilaterals															

	Required Coursework Numbers														
• Calculates changes in perimeter and area as the dimensions of plane figures change															
B. Knows how to solve problems involving surface area and volume of solids															
• Calculates and interprets surface area and volume of solids; e.g., prisms, pyramids, cylinders, spheres															
• Calculates changes in surface area and volume as the dimensions of a solid change															
• Uses two-dimensional representations of three-dimensional objects to visualize and solve problems															
C. Understands the concepts of similarity and congruence															
• Determines whether two figures are similar or congruent															
• Uses similarity and congruence to solve problems with two-dimensional and three-dimensional figures															
• Uses congruence and similarity criteria for triangles to prove relationships in geometric figures															
D. Knows the properties of lines (e.g., parallel, perpendicular, intersecting) and angles															
• Solves problems involving parallel, perpendicular, intersecting, and skew lines															
• Applies angle relationships (e.g., supplementary, vertical, alternate interior) to solve problems															

	Required Coursework Numbers														
E. Understands properties of triangles															
• Solves problems involving sides (e.g., Pythagorean theorem) and angles															
• Recognizes characteristics of special triangles; e.g., isosceles, right, 30-60-90															
• Solves problems that involve medians, midpoints, and altitudes															
F. Knows properties of quadrilaterals (e.g., rectangle, rhombus, trapezoid) and other polygons															
• Identifies geometric properties of various quadrilaterals and the relationships among them; e.g., parallelogram, trapezoid															
• Identifies relationships among quadrilaterals															
• Solves problems involving sides, angles, or diagonals of polygons															
• Identifies the lines of symmetry in a polygon															
G. Understands properties of circles															
• Solves problems involving circumference and area of a circle															
• Solves problems involving diameter and radius of a circle															
• Solves basic problems involving central angles, arcs, chords, and sectors															
H. Knows how to interpret geometric relationships in the *xy*-plane; e.g., transformations, distance, midpoint															

	Required Coursework Numbers														
• Identifies the characteristics of ordered pairs located in quadrants and on the axes of the coordinate plane															
• Uses coordinate geometry to represent and identify the properties of geometric shapes; e.g., Pythagorean theorem, area of a rectangle															
• Determines the distance between two points															
• Determines the midpoint of the segment joining two points															
• Interprets and solves problems involving transformations; i.e., translations, reflections, rotations, dilations															
• Proves the slope criteria for parallel and perpendicular lines and uses them to solve geometric problems															
• Uses coordinates to compute perimeters of polygons and areas of triangles and rectangles															
I. Understands systems of measurement; e.g., metric, customary															
• Solves measurement and estimation problems involving time, length, volume, and mass in standard measurement systems															
• Converts units within the United States customary system or the metric system															
• Converts units between the United States customary and metric systems															
• Uses appropriate units of measurement in a given context															

	Required Coursework Numbers														
J. Knows how geometric constructions are made															
• Identifies formal geometric constructions made with a variety of tools and methods; e.g., copying a segment, bisecting an angle, constructing parallel and perpendicular lines															
Objective 2: Understands and applies knowledge of probability, statistics, and discrete mathematics															
A. Understands how to interpret, analyze, and represent data presented in a variety of displays															
• Analyzes and interprets various displays of data; e.g., box plots, histograms, scatterplots, stem-and-leaf plots, two-way tables															
• Draws conclusions based on data; e.g., misleading representation of data, line of best fit, interpolation, association															
• Chooses appropriate graphs based on data; e.g., represents data accurately, chooses correct types of graphs															
B. Understands concepts associated with measures of central tendency and dispersion (spread)															
• Solves for the mean and weighted average of given sets of data															
• Determines and interprets mean, median, and mode in a variety of problems															
• Determines and interprets common features of sets of data; e.g., range and outliers															

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• Chooses appropriate measures of central tendency to represent given sets of data and justify the measures used															
• Identifies correct statements regarding a given numerical data set															
• Uses data to draw comparative inferences about two populations															
• Distinguishes between random and biased sampling															
C. Understands statistical processes and how to evaluate them															
• Understands statistics as a process for making inferences about population parameters based on a random sample from that population															
• Decides if a specified model is consistent with results from a given data-generating process; e.g., using simulation															
D. Understands how to make inferences and justify conclusions from sample surveys, experiments, and observational studies															
• Recognizes the purposes of and differences among sample surveys, experiments, and observational studies, and explains how randomization relates to each															
• Uses data from a sample survey to estimate a population mean or proportion															
• Develops a margin of error through the use of simulation models for random sampling															
• Uses data from a randomized experiment to compare two treatments															

	Required Coursework Numbers														
• Uses simulations to decide if differences between parameters are significant															
• Evaluates reports based on data															
E. Knows how to develop, use, and evaluate probability models															
• Uses counting techniques (e.g., the counting principle, permutations, combinations) to answer questions involving a finite sample space															
• Solves probability problems involving independent and dependent events															
• Finds the conditional probability of A given B, and interprets the answer in terms of the model															
F. Is familiar with how to use visual representations to model and solve problems															
G. Uses and interprets simple diagrams (e.g., Venn diagrams, flowcharts) to solve problems															